

A new species of *Spiochaetopterus* (Chaetopteridae: Polychaeta) from a cold-seep site off Hatsushima in Sagami Bay, central Japan

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Abstract.—*Spiochaetopterus sagamiensis*, a new species (Polychaeta: Chaetopteridae), is described from two specimens collected from a cold-seep site off Hatsushima in Sagami Bay, central Pacific side of Japan. In this species, the large chaetae on chaetiger 4 (A4) are distinctive in having a triangular profile of the head, a nearly straight ventral edge of the inflated distal part, and two dorsolateral grooves on the shaft. The species has trilobed notopodia on the first segment of the median region (B1), bilobed ones on the second (B2), and entire ones on the third (B3) and on all succeeding segments. Uncinal plates of neuropodium B2 have more than 30 teeth; the upper toothed edge is smoothly curved. Anterior eyespots are absent. *Spiochaetopterus sagamiensis* occurs in deep water (800–1100 m depth) and is the first member of this family to be recorded in a deep-sea chemosynthetic community.

Chaetopterid polychaetes commonly occur on mud and sandy mud bottoms from the intertidal to shallow shelf waters. In Japanese waters, two species of *Spiochaetopterus* are known: *S. okudai* Gitay, 1969 and *S. costarum* (Claparède, 1870) (Okuda 1935, Gitay 1969, Nishi & Arai 1996). Chaetopterids are poorly known from deep-sea bottoms: only one species, the type species *S. typicus* Sars, 1856, has been recorded from shallow water to a depth of 2700 meters off W. Greenland (Kirkegaard 1960), at depths of 20 to 1865 meters in Arctic Seas and the Atlantic Ocean (Fauvel 1914), and at depths of 35 to 2030 meters in the North Pacific and associated waterbodies (Uschakov 1955). Levin et al. (1991) listed unidentified chaetopterid polychaetes present in the fauna of seamounts from the eastern Pacific Ocean at depths of 1058 to 3353 meters. Other records from deep-sea bottoms are worthy of re-examination (e.g., Levenstein 1961; Hartman

1971; Hartman & Fauchald 1971). This paper describes a new species of *Spiochaetopterus* found in a deep sea cold-seep off Hatsushima in Sagami Bay (Miura 1988). It is the first chaetopterid polychaete found in a chemosynthetic community (cf. Desbruyères & Segonzac 1997) and the third species in the genus described from Japan.

Materials and Methods

During dive 115 of the Deep-sea Research Vehicle (DSRV) *Shinkai 2000* (observer: K. Egawa) in Sagami Bay, two chaetopterid specimens were collected with three *Calyplogena* shells at depths of about 800–1100 m (Sugiura & Egawa 1985). The specimens were fixed in 10% sea-water formalin on the mother ship and later transferred to 70% ethanol. The specimens were sent to the second author for further study of the faunal structure of the Hatsushima cold-seep site (Miura 1988).

Parts of the specimens, such as segment 7 of the anterior region and large (cutting) chaetae were removed dehydrated through an alcohol series, air-dried, and observed with scanning electron microscopy (Hitachi S-800). Type series were deposited in the Natural History Museum and Institute, Chiba (CBM-ZW). For the description, the terminology of Crossland (1904) and Bhaud et al. (1994) is followed. In these papers, three body regions are defined as region A (anterior), region B (middle) and region C (posterior); in each region, segments are numbered from anterior to posterior: for instance, the fourth segment of the anterior region is termed segment A4 or simply A4.

Family Chaetopteridae Malmgren, 1867

Genus *Spiochaetopterus* Sars, 1856

Spiochaetopterus sagamiensis, new species
Figs. 1–2

Spiochaetopterus sp.—Miura, 1988 (dive numbers 177 and 115 inadvertently switched in table 2).

Material examined.—Off Hatsushima, Sagami Bay, DSRV *Shinkai 2000* Dive 115, 5 Jun 1984, 35°01'N, 139°12'E, 800–1100 m, collected with *Calypptogena* shells, holotype (CBM-ZW-701), incomplete, with a fragment of tube and paratype (CBM-ZW-702).

Diagnosis.—*Spiochaetopterus* of small size, eyes absent, with one pair of long palps. Large (cutting) chaetae of segment A4 with inflated head. Distal end of A4 chaetae triangular ventrally; shaft without ventral groove, with two dorso-lateral grooves. Segment A7 with brownish ventral gland; A8 and A9 with whitish ventral glands observed in alcohol preserved specimens. Notopodia trilobed in segment B1, bilobed in B2, entire in B3 and following segments. Neuropodia entire in B1, bilobed in all other middle segments. Uncini with over 30, maximum 40 teeth on uncinal plates. Tube unbranched, smooth, not annulated, with serrated opening.

Description.—Both holotype and para-

type incomplete, lacking posterior region (region C). Holotype 18 mm long excluding palps, about 1 mm wide. Paratype 24 mm long excluding palps, 0.8–1.0 mm wide. Regions A and B (anterior and middle) creamy white, dorsal side of region B light brown in alcohol apart from glandular regions.

Region A narrow, 3.5 mm long for nine segments in holotype; 9 mm in paratype. Prostomium ovoid. Peristomium horseshoe-shaped, plump with prostomium on dorsal side (Fig. 1B). Eyespots absent. Prostomial antennae absent (Fig. 1B, C). Paired palps long, grooved, 10 mm long in holotype (14 mm in paratype), arising from posterior border of peristomium, near posterolateral border of prostomium (Fig. 1A, B, C, E). Dorsal groove ciliated, extending from base of palpi in A1 to A9 (Fig. 1B, E). Ventrum of region A with a long slender plastron (ventral glandular area) (Fig. 1A, C, E), with longitudinal white stripes, separated into five portions (Fig. 1C); portion I, longer than others, overlaying from peristomium to segment A2, white in colour, portion II from A3 to A4, narrower at A4, cream-colored; portion III from A5 through anterior half of A6, dark brown; portion IV from posterior half of A6 through A7, white; portion V from A8 to A9, white. Segments A1–A3 short, parapodia with a single row of 25–40 lanceolate chaetae; A4 elongate, with two large (cutting) chaetae, and more than 20 lanceolate chaetae; A5–A9 longer and wider than anterior three segments, with single row of 35–40 lanceolate chaetae (Fig. 2E–H).

Large (cutting) A4 chaetae obliquely triangular, occurring singly on both side (Fig. 2A–F); overhang of ventral edge of head distinct but weak. Distal part 300 μ m long, 230 μ m wide, with blunt distal tip and nearly horizontal ventral edge 200 μ m wide; shaft 1300 μ m long, 10–15 μ m wide in middle portion, asymmetrical, nearly oval in cross section, without ventral groove; neck between head and shaft as wide as shaft (Fig. 2A, B, E).

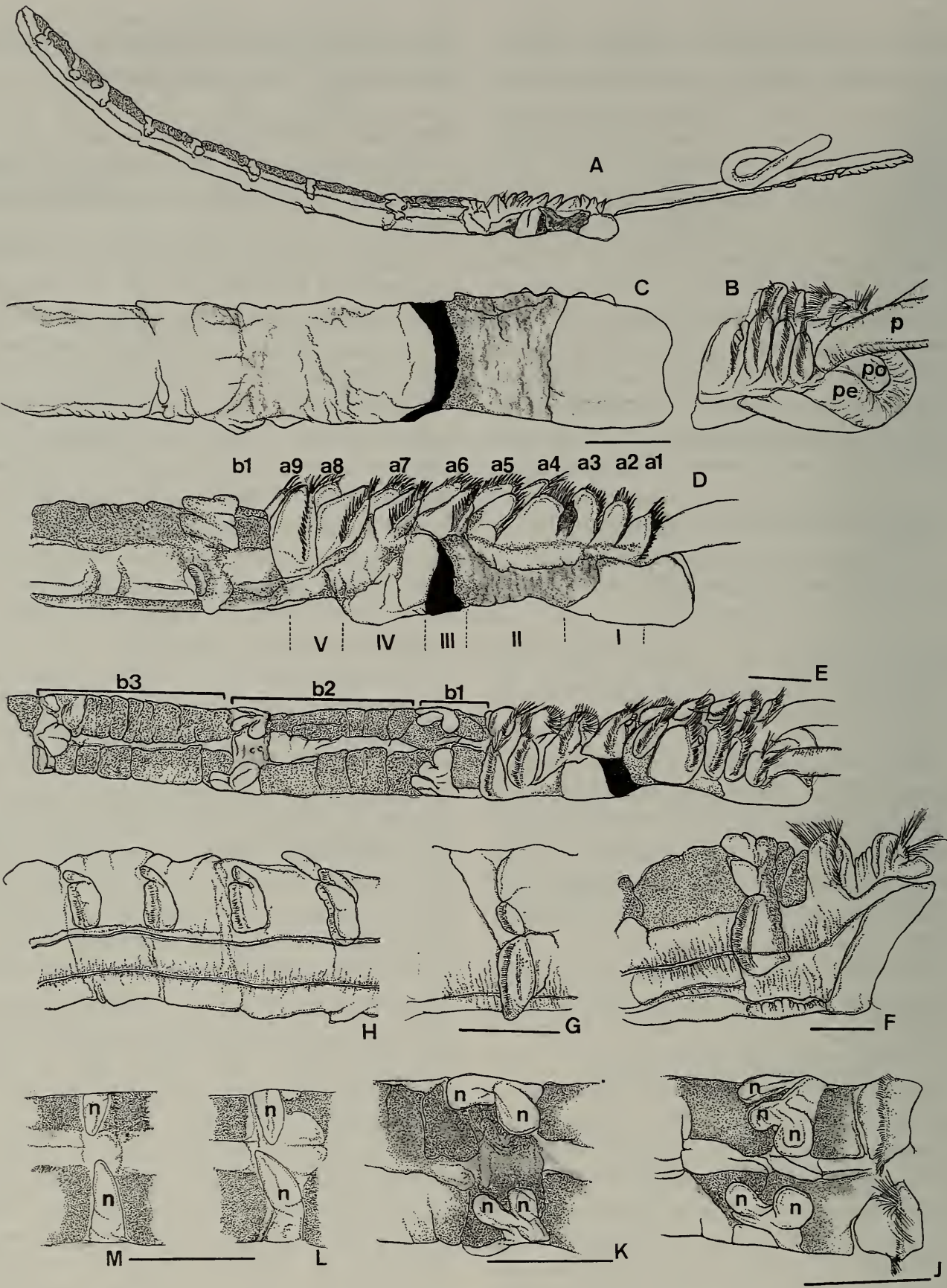


Fig. 1. *Spiochaetopterus sagamiensis* new species, drawn from holotype (A–E, J–M) and paratype (F–H). For all drawings (A to M) anterior part of the body is on the right. A. Whole body, lateral view. B. Anterior portion enlarged. C. Anterior portion including A, segment B1 and anterior B2, ventral view. D. Same, lateral view. E. Regions A and B, dorso-lateral view. F. A8 to B2, lateral view. G. B3 neuropodium, lateral view. H. A6 to B8 showing rami of neuropodia, ventrolateral view. J. Segments A9 and B1, dorsal view. K. Segment B2, dorsal view. L. Segment B3, dorsal view. M. Segment B4, dorsal view. Abbreviations.—I to V, indication



Fig. 2. *Spiochaetopterus sagamiensis* new species. Scanning electron micrographs of chaetae and tube of paratype. A–D. Distal part of A4 large (cutting) chaeta, ventral view (A, B) and lateral view (C, D); scales equal 200 μm (A) and 50 μm (B–D). E & F. Distal part of A4 large (cutting) chaeta, ventrolateral (E) and anterior dorsolateral view (F); unlabeled arrows point to dorsolateral groove on shaft; scale equal 100 μm (E) and 50 μm (F). G & H. Chaetae from region A, close-up view of thoracic setae; scales equal 75 μm (G) and 50 μm (H). I. Uncini of B2 neuropodium; scale equals 10 μm . J. Part of tube, lower arrow shows undulation, upper one serration; scale equals 750 μm .

of ventral parts of region A, i.e., separated portion of ventral plastron and posterior peristomium; a1 to a9, segments of region A; b1, first segment of region B; b2, b3, second or third segment of region B; n, notopodium; ne, neuropodium; p, palp; pe, peristomium; po, prostomium. All scales equal 0.5 mm.

Head of A4 chaetae inflated, obliquely truncate; upper tip of head tilted toward longitudinal axis of body; consequently external lateral oblique edge longer than internal edge. Horizontal edge smoothly circular without ventral sinus. Dorsolateral grooves on shaft (Fig. 2E, F). Ventral edge of oblique plane perpendicular to axis of shaft. Collar decreasing regularly in diameter.

Remaining anterior segments (A5–A9) large, inflated, shorter and wider ventrally; parapodia with 35–40 lanceolate chaetae in single rows; lanceolate chaetae asymmetrical, longitudinally folded, slightly brownish, with smooth surface and serrated edges (Fig. 2G, H).

Region B longer than anterior region, with eight elongate glandular segments (seven in paratype); paddle and cupule absent. B1 shorter than following segments (Fig. 1E). Middle parapodia biramous, along posterior margins of segments (Fig. 1E, E, H). Notopodia with one to three lobes; neuropodia bilobed except in segment B1, with inflated uncinal plates. Notopodia of segment B1 foliaceous, trilobed, medial lobes resulting from a subdivision of inner lobe; outer lobe cirriform (Fig. 1E, J). Notopodia of B2 bilobed, with single, entire inner lobes (Fig. 1E, K); those of segments B3 and following entire (Fig. 1L, M). Neuropodia of segment B1 entire, with only lower lobe developed (Fig. 1F); other neuropodia bilobed, with rounded upper lobes and elongate lower lobes (Fig. 1G, H). On neuropodia of B3, teeth on uncinal plate directed backward on anterior smaller dorsal lobe; that on larger ventral lobe directed forward.

Uncini bluntly triangular, with single row of 35 to 40 minute teeth ($n = 6$, average 38.2 ± 1.94) (Fig. 2I). Segment B4 of paratype with more than 40 uncini on outer lobe and more than 15 on inner one. Outer serrated edge of uncinal plate smoothly curved.

Posterior body region (region C) lacking in types.

Both examined specimens are mature, with segments of region B distended; the notopodia appear as distended, inflated transverse bags.

Tube is fragile, slender, straight, smooth, and not annulated. Collar folds occur at subequal intervals along tube length. Tube wall is thin, consisting of several layers of secretion, and regularly undulated externally (Fig. 2J).

Etymology.—The species epithet is derived from the type locality, Sagami Bay.

Remarks.—Among the 11 described species in *Spiochaetopterus*, 5 species lack eyespots: *S. sagamiensis*, *S. typicus* Sars, *S. bergensis* Gitay, *S. okudai* Gitay and *S. monroi* Gitay. These five species may be distinguished mainly on the shape of the ventral edge of the oblique section of A4 setae: straight without protuberances in *S. sagamiensis*, circular in *S. typicus*, with three protuberances in *S. bergensis* (Bhaud, 1998). In these three cases the ventral edge is horizontal, perfectly perpendicular to the shaft *Spiochaetopterus okudai* and *S. monroi* were reexamined. The ventral edge of A4 chaetae is oblique relative to the longitudinal axis of the shaft in both species. *S. okudai* lacks the sinus and *S. monroi* has a marked sinus. Secondarily, *Spiochaetopterus okudai* and *S. monroi* have bilobed notopodia in region B (Gitay 1969); however, most notopodia are entire in *S. sagamiensis*. From observations by the third author of Atlantic-Mediterranean and Pacific species, smoothly curved serrated edges of uncinal plates of *S. sagamiensis* may be regarded as a discriminatory character.

In conclusion, four diagnostic characteristics may be retained for this new species: eyes are absent; the morphology of A4 chaetae with a triangular profile of the head, a nearly straight ventral edge of the inflated distal part, and two dorsolateral, and not ventral, grooves on the shaft; the notopodia on B3 have only one lobe; and, outer serrated edges of uncinal plates smoothly curved.

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